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| US | 4463859 | | |

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# (54) Baby's feeding apparatus

(57) A baby's feeding apparatus has a rigid container with an open mouth and a mouthpiece suitable for reception in a baby's mouth. Valve means 13, 14 extends across the open mouth and divides the interior of the container from space within the mouthpiece. The valve means includes a non-return valve 13 which allows flow of feed in the direction from the container. A collar 4 releasably couples the mouthpiece and the valve means to the container at its open mouth. The mouthpiece has a self-closing slit-shaped opening 8 which allows passage therethrough of feed from the apparatus to a baby in use. There is a limited entry of air between the collar 4 and the container and into the container to equalise pressure within the container with atmospheric. The mouthpiece may be manipulated to force feed through the opening 8. A number of embodiments of novel valve useful in the apparatus are also described.

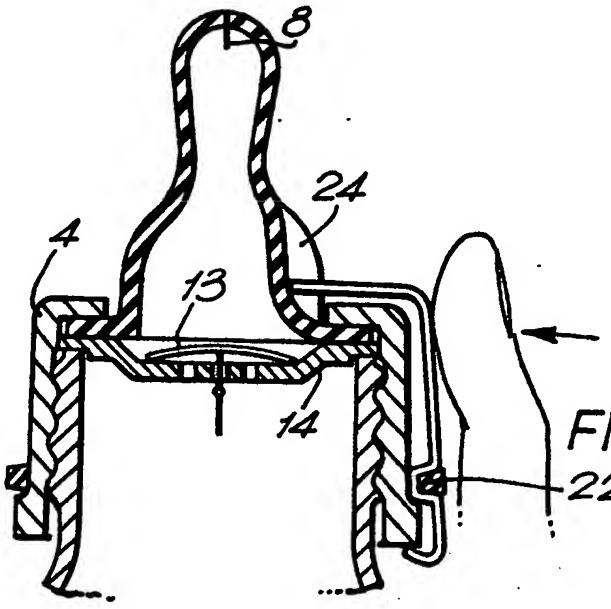


FIG.7.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG.1.

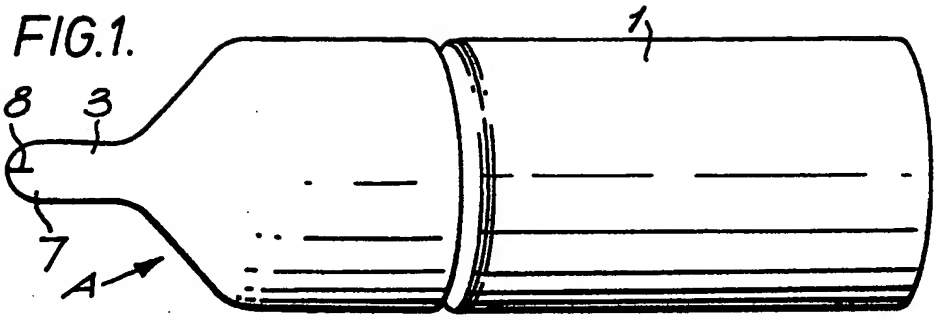
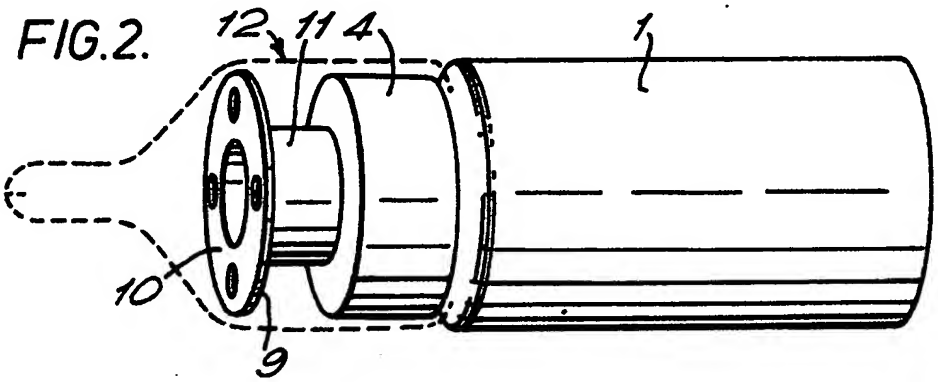



FIG.2.



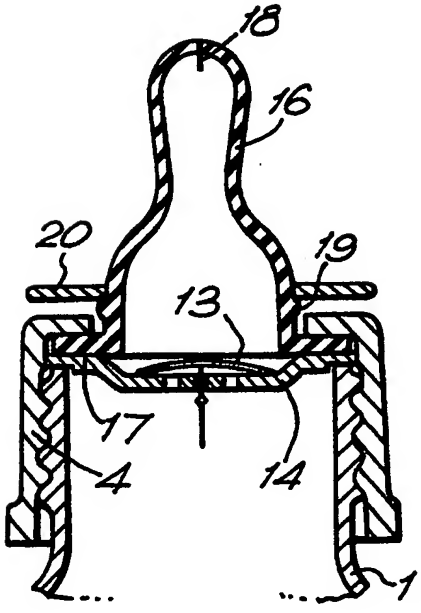




FIG.4.

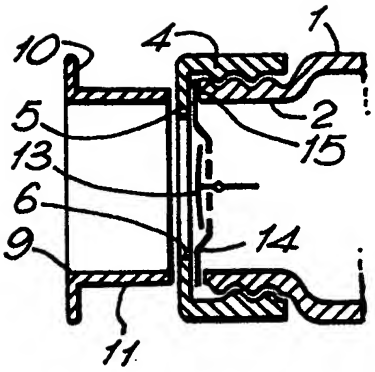



FIG.3.

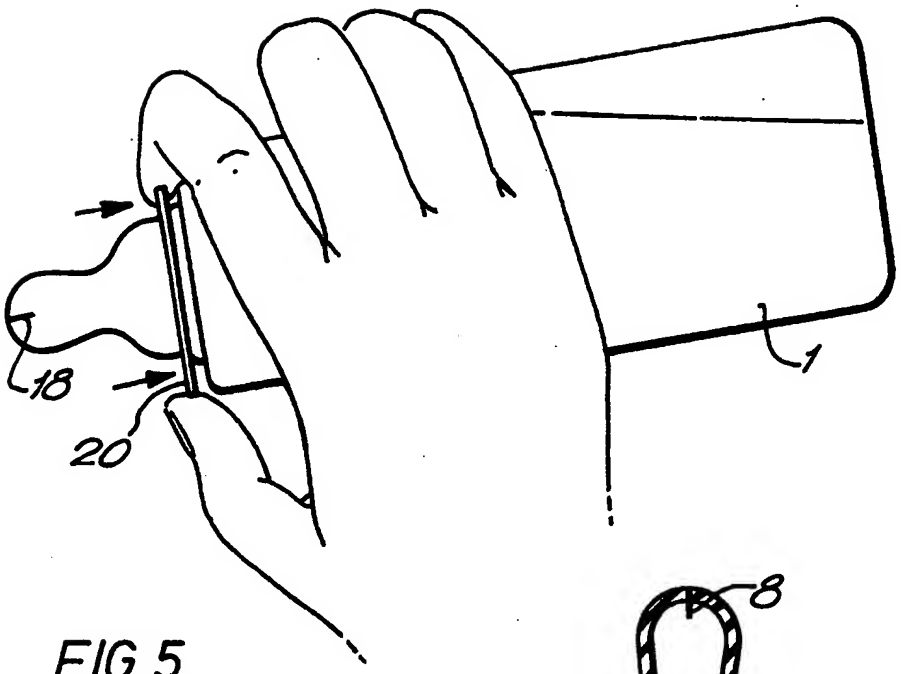



FIG.5.

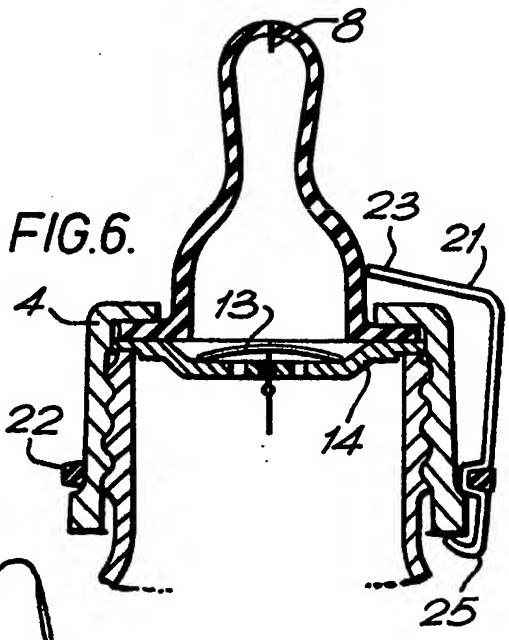



FIG.6.

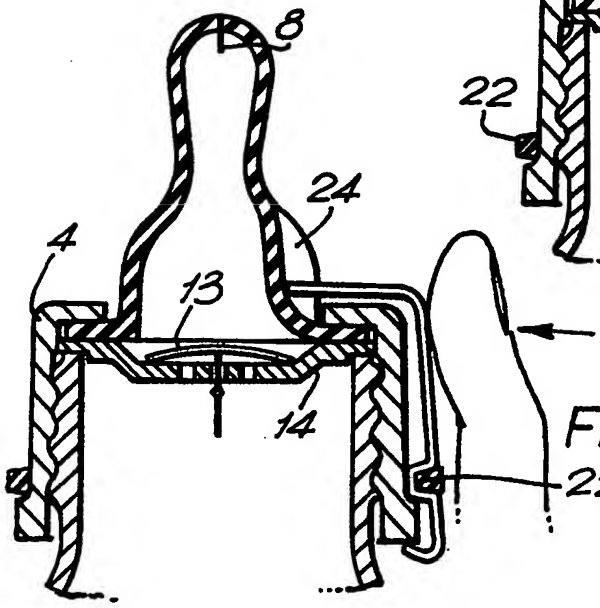



FIG.7.

FIG.8.

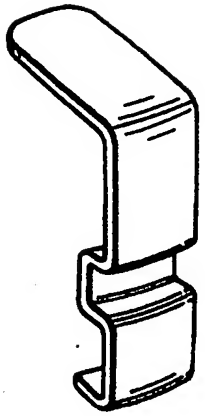


FIG.9.

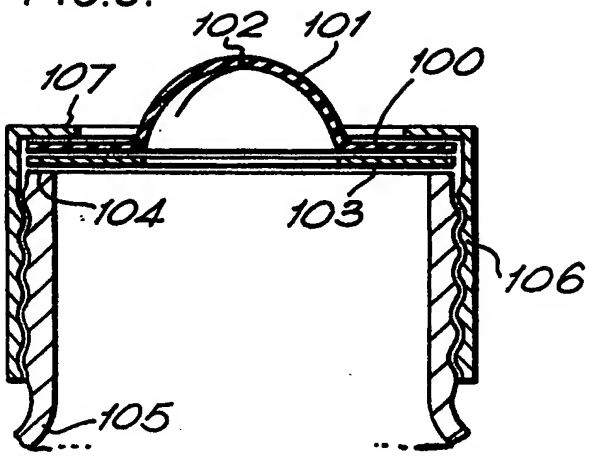
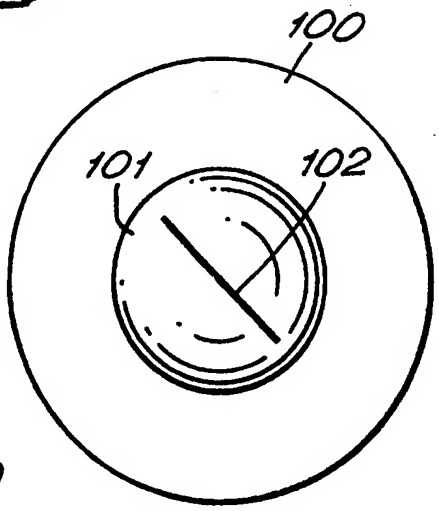



FIG.10.



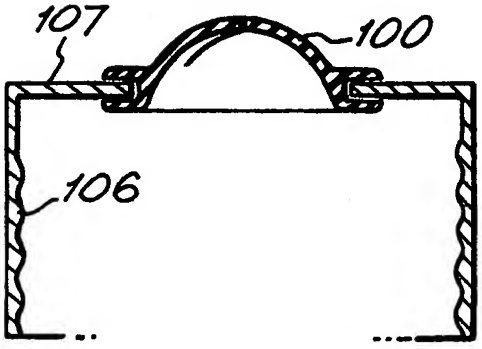




FIG.11.

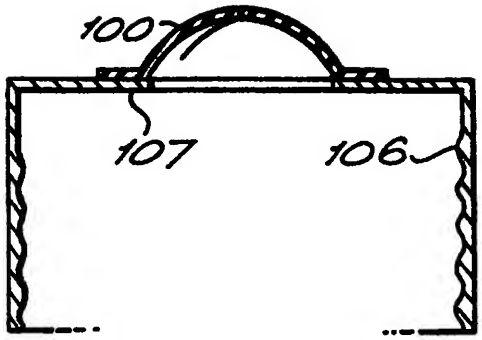



FIG.12.

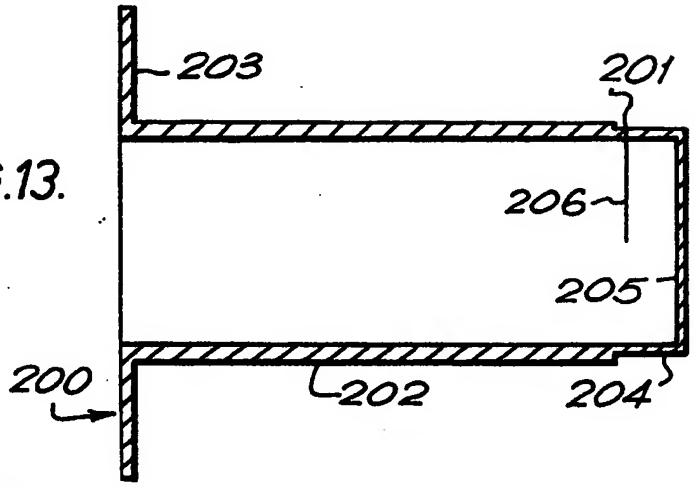



FIG.13.

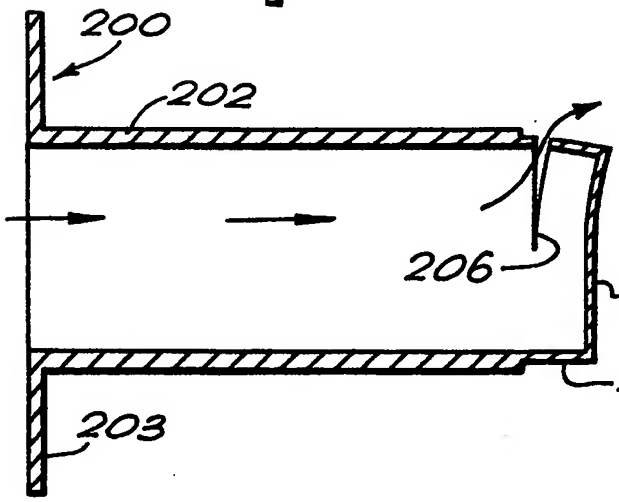



FIG.14.

SPECIFICATION

**Baby's Feeding Apparatus**

This invention relates to feeding apparatus suitable, for example, for babies with poor sucking ability, and vomiting babies.

Poor sucking ability is found, for example, amongst post-operative and sleepy babies; babies with neurological abnormalities, including cerebral palsy; dysautonomia; idiopathic problems; physically and mentally handicapped babies and children; babies born with mouth abnormalities such as cleft lip, cleft palate, etc; babies weakened by illness; and borderline premature babies. Vomiting babies, for example babies with hiatus hernia, require thickened feeds.

In my British Patent 2131301, I describe a number of embodiments of baby's feeding apparatus which comprise: a generally rigid generally cylindrical member defining a fixed volume; means allowing the introduction of a selected initial volume of feed within said fixed volume; a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from said initial volume; means allowing the introduction of air into said fixed volume; and means controllable by the mother independently of the baby for regulating the flow of feed.

The term "mother" is employed herein, for convenience, to indicate the person feeding the baby. No particular significance is to be attributed to the choice of the word "mother", this term where appropriate being intended to include, for example, both "father" and "nurse".

Though my aforesaid Patent Specification describes a number of alternative ways of allowing air to be introduced into the original fixed volume, including arrangements in which one-way air valves are provided either on the mouthpiece or on the bottle itself, these arrangements are not wholly satisfactory. If the valve is placed on the bottle, then the bottle itself must be a specially engineered product. One cannot use conventional bottles. If the valves are placed on the mouthpiece, there tend to be difficulties in manufacture, particularly when manufacturing in significant scale, to ensure that manufacture is kept within acceptable tolerances for the operation of the valve. Since mouthpieces do need to be replaced from time to time, mothers must be reasonably assured that substantially the same level of manual pressure on the appropriate part of the mouthpiece will achieve substantially the same amount of feed being transmitted to the baby. I have also found, in practice, that the provision of valves on the mouthpiece tends to make the mouthpiece relatively expensive to manufacture.

The present invention arises in part from my desire to improve upon my previous proposals and to devise new and improved embodiments of baby's feeding apparatus suitable for babies with poor sucking ability. The embodiments described herein each include a valve provided in a relatively simpler, more convenient, and less expensive form than in my previous proposal. However, it is to be understood that the present invention in its broadest context is not limited to use with babies having poor sucking ability. Embodiments of feeding apparatus can be constructed within the scope of the present invention which are suitable for use by ordinary babies.

I describe below embodiments of baby's feeding apparatus in accordance with my present invention which comprise: a generally rigid container having an open mouth; a mouthpiece suitable for reception in a baby's mouth; valve means arranged to extend across the said open mouth to divide the interior of the container from space within the mouthpiece and including a non-return valve allowing flow of feed in a direction from the container; and a collar adapted for releasably coupling the mouthpiece and the valve means to the container at its open mouth; the mouthpiece having a self-closing generally slit-shaped opening adapted to allow passage therethrough of feed from said apparatus to a baby in use; and the arrangement allowing limited entry of air between the collar and the container and into the container to equalize the pressure therewithin with atmospheric.

This arrangement reduces the likelihood that air will be swallowed giving the baby wind. Unlike conventional feeding bottles, this arrangement does not rely upon air entering a pinhole or like opening in a teat end to equalize pressure within the bottle with atmospheric, which conventional arrangement requires the baby to be able to take air into its mouth with a significant likelihood that air will be swallowed giving the baby wind. Equally, by the express avoidance of a pinhole and its substitution by a self-closing slit-shaped opening, my arrangements described below avoid the problem of sucking back feed which the baby has taken into its mouth, which equally gives rise to a problem of wind since air can be sucked into the baby's throat through its nose to be swallowed with the next mouthful. The non-return valve will close preventing back-pressure as soon as pressure within the mouthpiece exceeds pressure within the container. The means by which air is introduced into the container can be relatively unsophisticated. For example, I have found that sufficient leakage of air is allowed in practice in commercially available standard wide-mouthed infants' feeding bottles that, provided that the rear surface of the valve means, where it confronts the container end at the open mouth in use, is provided with a suitable groove on the side adjacent the container end, there is adequate entry of air in practice. As an alternative, a groove can be formed in the edge of the container.

Suitably, though not necessarily, the feeding apparatus may include means controllable by the mother independently of the baby for regulating the flow of feed, rather along the lines of arrangements described in the Specification of my aforementioned Patent. For example, the mouthpiece may include a region of sufficient extent and flexibility as to be palpable by hand by the mother, thereby to provide a means of regulation, or the mouthpiece may be provided with a trigger arrangement. In preferred arrangements, the apparatus includes means which have the effect of limiting the maximum volume of

feed in each palpation. The effect in these arrangements is to apply external pressure through the agency of the mother to the mouthpiece. This increases the pressure in the mouthpiece closing the non-return valve and forcing feed through the self-closing slit-shaped opening in the mouthpiece teat end. On relaxing pressure the slit-shaped opening closes and a further charge of feed passes into the mouthpiece past the valve. The resultant partial vacuum in the container is made up by the entry of air otherwise than through the teat opening, as aforesaid.

With the non-return valve in the valve means and the self-closing slit in the mouthpiece both providing security for the contents of the container, there is little likelihood of spillage (as would occur, for example, through round or pinhole teat openings in a conventional feeding apapratus) if feed is mixed in the container by shaking.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings, in which:—

Fig. 1 shows an overall perspective view from one side of a first embodiment of apparatus in accordance with this invention;

Fig. 2 shows the apparatus of Fig. 1 with the mouthpiece (position indicated in phantom lines) omitted;

Fig. 3 is a partial sectional view of the apparatus of Figs. 1 and 2 with the mouthpiece omitted;

Fig. 4 is a partial sectional view through the mouthpiece, valve plate, collar and container end in an alternative embodiment;

Fig. 5 is a generally schematic view illustrating how the apparatus of Fig. 4 is used in practice by a mother;

Fig. 6 is a view generally similar to Fig. 4 showing a yet further embodiment;

Fig. 7 is a view generally similar to Fig. 6 showing how the trigger arrangement in the embodiment of Fig. 6 is operated;

Fig. 8 is a perspective view of the trigger element in the apparatus of Figs. 6 and 7;

Fig. 9 is a sectional view through the open end of the container of a baby's feeding apparatus in accordance with the present invention and incorporating a novel valve, the mouthpiece having been omitted for clarity;

Fig. 10 is a plan view of the valve shown in Fig. 9;

Figs. 11 and 12 show views generally similar to Fig. 9, but with the bottle itself omitted, illustrating modifications.

Figs. 13 and 14 are longitudinal sectional views through another embodiment of novel valve useful in a baby's feeding apparatus in accordance with the present invention, and illustrating the mode of operation of the valve.

The apparatus of Figs. 1 to 3 is embodied as a feeding bottle and is suitable both for simple milk feeds and also for thickened feeds and for first-stage solid feeds, all of which are included within the terms "fluid feeds" or "feeds" as used herein.

The feeding bottle, generally indicated *A* comprises a conventional wide necked infants' feeding bottle 1 of a kind in wide use in hospitals, for example. The bottle 1 has a wide mouthed opening 2 with an external screw thread. The apparatus of Fig. 1 to 3 further includes a mouthpiece 3 and a collar 4 over which the mouthpiece fits and which is adapted for mounting the mouthpiece 3 on the bottle 1. The collar 4 has an inwardly directed flange 5 and a central opening 6 somewhat narrower than the wide mouth of the bottle 1.

The mouthpiece 3 is formed of a soft latex rubber or from a plastics material with similar properties and has a teat end 7 provided with a self-closing generally slit-shaped opening 8. The configuration is such that when the pressure inside the mouthpiece is greater than that ouside, the slit-shaped opening tends to open and feed passes out through the mouthpiece, whereas, when the pressure inside the mouthpiece is substantially the same as or less than the pressure outside the mouthpiece, the slit-shaped opening tends to close preventing flow in either direction therethrough. The orientation of the slit-opening at the teat end 7 allows for some selection of the rate of feed by the mother as described in connection with the embodiment of Fig. 7 of my Patent 2131301.

Also mounted within the mouthpiece is a spacer or extension piece 9. In the embodiment of Fig. 1 to 3 this spacer comprises a disc 10 and an integral cylindrical extension 11. The spacer 9 may, alternatively, simply form an extension of the collar 4, in which case the disc 10 may be omitted.

As will be clear, particularly from Fig. 2, this configuration of spacer and collar defines a region, generally indicated 12, adapted for the application of pressure thereto by the mother to deliver feed through the opening 8 and into the baby's mouth. The spacer additionally places an upper limit on the feed which can be delivered with each application of pressure.

In order to prevent back-flow from the mouthpiece into the bottle 1 when pressure is applied in this way, a valve means is provided, as best shown in Fig. 3. The valve means may comprise a simple poppet valve member 13 formed of nylon or other suitable plastics material and retained on a perforated valve plate 14 which, as shown in Fig. 3 is trapped between the collar and the end of the bottle.

I have found that the screw thread connection between the bottle and the collar in commercially available wide-mouthed bottles is not so solid as to prevent adequate leakage of air between the collar and the bottle with atmospheric when the apparatus is used. To this end, the rear surface 15 of the valve plate 14 is provided with a generally radial groove allowing passage of this leakage air into the interior of the bottle.

The sequence of operations in use of the apparatus is as follows: with the desired volume of feed in the bottle 1, and with the bottle upright the mother squeezes the mouthpiece in the region 12 to force air out through the slit opening 8. The valve 13 will close. The bottle is then inverted at a slight angle and the pressure on the mouthpiece relaxed. The slit opening 8 closes and the valve 13 opens admitting feed into the mouthpiece. The bottle is

then placed upright again and the process repeated. When the mouthpiece is filled by repeating the process described above, the teat end is placed in the baby's mouth. Thereafter, with each squeeze in the region 12, a measured amount of feed will be delivered through the slit opening 8 and into the baby's mouth. Of course, if the baby can suck, at least to some extent, then the mother will plainly need to squeeze less in the region 12 or possibly not at all. Where a baby can suck, even though its ability may not be ideal, adjustment in the size of the slit opening can enable the baby to manage the bottle itself with the mother simply supporting the bottle, and without the mother needing to apply pressure in the region 12. As feed passes from the interior of the bottle into the mouthpiece, this will tend to create a partial vacuum within the bottle causing an ingress of air through the passageway defined between the screw threads of the collar and the bottle and along the generally radial groove in the rear face 15 of the valve plate and into the bottle. With this arrangement there is virtually no likelihood of this air being sucked into the baby's mouth.

The embodiments of Figs. 4 and 5 works in a substantially similar fashion, except that in this case the mouthpiece comprises a teat 16 of generally conventional overall configuration, though having a self-closing slit opening 8 rather than the conventional hole(s). Teat 16 has a flange 17 which is trapped together with the valve plate 14 between the bottle end and the collar. It also has an external circumferential rib 19 on which a rigid ring 20 suitably of a hard plastics material is located.

As best shown in Fig. 5, pressure applied to the ring 20 by the mother in the longitudinal direction of the bottle reduces the volume within the mouthpiece 16 causing feed to pass into the baby's mouth. On releasing the ring 20, the slit 8 tends to close while the valve 13 will open admitting feed into the mouthpiece. As in the embodiment of Figs. 1 to 3 provision is made for air leakage to equalize the pressure within the bottle 1 with atmospheric.

The embodiment of Figs. 6 to 8 shows a different arrangement for regulating the flow of feed by the mother. A trigger member 21 is mounted on one side of the collar 4 by means of a rubber ring 22 so that a finger 23 bears against the side wall of the teat shaped mouthpiece in the region 24, while the other end 25 of the trigger member 21 is located at the far end of the collar 4. Manual pressure as shown in Fig. 7 closes the valve 13 and forces feed out through the slit-shaped opening 8. On releasing pressure on the trigger member 21, the slit-shaped opening 8 will close and the valve member 13 will open so that feed passes into the mouthpiece. The mouthpiece tends to return to its original configuration (Fig. 6) as a result of its own elasticity.

I have devised a number of preferred embodiments of valve means useful in place of the simple poppet valve member employed in the arrangements illustrated in Figs. 1 to 8. I believe these valves to be novel *per se*.

I describe below examples of my novel valves together with associated parts of the baby's feeding apparatus from which, it is believed, the skilled person will have no difficulty in understanding the construction of the baby's feeding apparatus as a whole and will have no difficulty in the construction of such apparatus.

The valve generally indicated 100 in Figs. 1 and 2, is formed in one piece and has a generally disc-shaped form, the central region thereof being dished as shown at 101 to form a generally dome-shaped region. In this region a self-closing generally slit-shaped opening 102 is provided as shown. With a valve of this construction, a moderate excess pressure on the concave side opens the slit-shaped opening to allow passage, while zero excess pressure or a moderate excess pressure on the convex side simply closes the opening presenting reverse passage. The excess relative pressure across the valve at which it operates in this fashion can readily be selected by simple trial and experiment with valves of different material and of different thickness, with varying degrees of dishing, and with slits of varying length. I have found that suitable materials include rubber and silicone.

In the arrangements of Fig. 9, the valve 100 is mounted together with a washer 103 across the open mouth 104 of a conventional wide-mouthed infant's feeding bottle 105 by means of a collar 106 threadedly engaged with the bottle 105. A mouthpiece, not illustrated, with its self-closing slit-shaped opening may either be mounted externally over the collar 106 somewhat in the manner shown in Fig. 1 to 3 (with the possible additional security of an external securing ring (not shown)), or may be of the kind which can be held in place by means of an inturned flange 107 of the collar 106 rather in the manner shown in Fig. 4 to 7. The washer 103 has a central opening 108 generally corresponding to the size of the dome 101. The washer serves for support of the valve 100, preventing its collapse inwardly of the bottle, and enabling it to be formed of thinner material than would otherwise be required. The washer is suitably formed of a plastics material.

As shown, the washer and valve are formed entirely separately, which I find provides a construction which is both relatively inexpensive to manufacture and which is easily cleanable in use, the sterilization of baby's feeding apparatus being so important for the health of the baby, and all the more so for babies with poor sucking ability or with a tendency to vomit whose general health will be poor.

Other arrangements of a simple and efficient non-return valve means suitable for use in baby's feeding apparatus are also possible. For example, and as shown in Figs. 11 and 12, the valve may be supported on the collar or screw cap 106, either somewhat loosely as shown in Fig. 11 or fixedly about its periphery as shown in Fig. 12. Since in both these cases the inwardly extending flange 107 provides a degree of support for the valve 100 except in the region of the dome, no separate washer is required. The arrangement of Fig. 11 has one further advantage in that it not only eliminates the need for the washer and requires the valve to

remain together with the collar in use so that there is less likelihood of the valve itself being mislaid, which advantages are also shown by the arrangement of Fig. 12, but also in the view of the degree of flexibility inherent in the valve, should it become worn or damaged, it could be forcibly detached from the collar 106 and replaced with a new valve.

To allow entry of air to equalise pressure in the bottle either the valve 100 on its rear face, the washer 103 on either face, or the mouth 104 of the bottle has a shallow groove.

Figs. 13 and 14 illustrate a spacer 200 which serves a similar function in alternative embodiments to the space 9 of the embodiment of Figs. 1 to 3. The spacer 200 is formed as a single moulding with a non-return valve 201 of extremely simple construction. The illustrated one piece moulding 200 comprises a cylinder 202 with a relatively thick wall having an annular flange 203 at one axial end. At its other axial end, the cylinder has a short cylindrical surface section 204 with a relatively thinner wall and an end wall 205. Formed in the thin walled cylindrical section 204 is a slit 206 suitably extending up to half-way or more circumferentially about the cylinder. The slit is suitably formed as an additional step after moulding the spacer 200.

The flange 203 is adapted to be received in use between the edge of the open mouth (such as 104—Fig. 9) of a conventional wide-mouthed infants' feeding bottle and an inturned flange (such as 107) of a co-operating collar 106 threadedly engaged with the bottle. The cylinder 202 extends within the mouthpiece (which may be either of the kind having a flange which is received together with the spacer flange between the bottle end and the collar, or may be mounted over the collar), and serves to divide the interior of the bottle (container) from space within the mouthpiece (i.e. the space between the exterior of the cylinder and the interior surface of the mouthpiece). The mouthpiece (not illustrated in this embodiment) will again have a self-closing generally slit-shaped opening. Embodiments including the novel combined spacer and valve of Figs. 13 and 14 operate in substantially similar fashion to the other embodiments described above. Specifically, with the space between the cylinder and the mouthpiece filled with feed, if the mother applies pressure to the mouthpiece (the thick walled cylinder portion serving a limiting factor in this embodiment in a similar fashion to the spacer 9 of the embodiment of Figs. 1 to 3) feed will be forced through the self-closing generally slit-shaped opening in the mouthpiece into the baby's mouth. Relaxation of pressure by the mother will close the mouthpiece slit-shaped opening. Reduced pressure in the space within the mouthpiece between the mouthpiece and the outside of the spacer as compared with the pressure within the bottle container will open the valve defined by the slit 206 in the thin walled portions 204, as shown in Fig. 14, thereby drawing more feed from the container into the mouthpiece so that operation can be repeated. There is a requirement for limited entry of air between the collar and the container and into the container to equalise pressure therewithin with atmospheric, in the same way as described in previous embodiments. When pressure is again equalised as between the interior of the container and the space in the mouthpiece between the spacer and the mouthpiece wall, the valve will close to the position shown in Fig. 13. The valve thus acts as a non-return valve.

I have found this particular embodiment of valve to be capable of being manufactured relatively simply and relatively inexpensively. I have also found that in practice embodiments employing this combined spacer and valve are quite easy to use with both mothers having to feed babies with poor sucking ability, and normal babies not having a pronounced sucking difficulty readily able to learn the technique required to use these embodiments. The provision of the spacer with the valve makes the feeding apparatus much easier to handle by mothers who are new to it since the quantity of feed which passes to the baby with each application of pressure by the mother is determined by the presence of the thick walled cylindrical portion. Because the cylinder extends into the central region of the mouthpiece, the amount of feed retained in the mouthpiece is relatively less than in other arrangements.

CLAIMS

1. A baby's feeding apparatus comprising: a generally rigid container having an open mouth; a mouthpiece suitable for reception in a baby's mouth; valve means arranged to extend across the said open mouth to divide the interior of the container from space within the mouthpiece and including a non-return valve allowing flow of feed in a direction from the container; and a collar adapted for releasably coupling the mouthpiece and the valve means to the container at its open mouth; the mouthpiece having a self-closing generally slit-shape opening adapted to allow passage therethrough of feed from said apparatus to a baby in use; and the arrangement allowing limited entry of air between the collar and the container and into the container to equalize the pressure therewithin the atmospheric.

2. Apparatus according to Claim 1, wherein the valve means, where it confronts the edge of the container end at said open mouth in use, is provided with a groove on the side of said valve means adjacent to said container end, said groove forming part of the passageway for said limited entry of air.

3. Apparatus according to Claim 1 or Claim 2, wherein the edge of said container at said open mouth is formed with a groove, which groove forms part of the passageway for said limited entry of air.

4. Apparatus according to any preceding claim, including means controllable by the mother independently of the baby for regulating the flow of feed in use.

5. Apparatus according to Claim 4, wherein the mouthpiece includes a region of sufficient extent and flexibility as to be palpable by hand by the

mother, thereby providing a means of regulation of the flow of feed by the mother.

6. Apparatus according to Claim 4, wherein said means controllable by the mother comprises a trigger arrangement.

7. Apparatus according to Claim 6, wherein a trigger member is mounted on one side of said collar by means of a retaining ring, at least a region of the side wall of the mouthpiece being flexible and said trigger member including a finger portion bearing against the said flexible region, application of hand pressure by the mother to said trigger member being effective to press said finger portion against said flexible region, thereby to compress feed within the mouthpiece, the said flexible region having sufficient elasticity to return to its original configuration upon release of hand pressure.

8. Apparatus according to Claim 4, wherein said mouthpiece comprises a teat formed of flexible material provided on its side wall with an external circumferential rib on which is located a rigid ring, whereby manual pressure applied to said rigid ring axially of said apparatus in the direction of said container is effective to compress feed in said teat, the teat having sufficient elasticity to return to its original configuration upon relaxation of pressure against said rigid ring.

9. Apparatus according to any preceding claim, wherein said valve means comprises a valve plate adapted to be held between said collar and the container at its open mouth, the valve plate having one or more openings therethrough and a poppet valve member adapted to lift from said one or more openings to allow passage of feed from said container into space within the mouthpiece when pressure within the container exceeds the pressure within the mouthpiece, the poppet valve member including means preventing its detachment from the valve plate.

10. Apparatus according to any of Claims 1 to 8, wherein said valve means comprises a one-piece, generally disc-shaped member provided with a generally dome-shaped region in which is formed a self-closing generally slit-shaped opening, the said opening being adapted to open when said member is exposed to a predetermined excess pressure on the concave side of said dome-shaped region, said valve member being adapted to be located in said apparatus with said concave side towards the container.

11. Apparatus according to Claim 10, wherein said valve member is generally disc-shaped, being dished in its central region to provide said dome-shaped region, said valve member being adapted to be located in use together with a washer providing support therefor between the edge of said container at its open mouth and said collar.

12. Apparatus according to Claim 10, wherein the collar has an inwardly directed flange, the circumferential edge of said valve member being fitted to the circumferentially inner portion of said flange of said collar.

13. Apparatus according to any of Claims 1 to 5, wherein a spacer extends internally of said mouthpiece, said valve means being provided at the distal end of said spacer, the interior of said spacer being open to the interior of said container.

14. Apparatus according to Claim 13, wherein said spacer comprises a cylinder having a flange adapted to be received between the edge of said container at its open mouth and the collar, the distal end of said cylinder having a closed end wall, and an adjacent portion of the cylindrical wall being formed with a slit which extends partway circumferentially about the cylinder, the material of the cylinder being sufficiently flexible for the said slit to open to allow passage of feed from the interior of the container and the interior of the cylinder to space within the mouthpiece exteriorly of the cylinder upon the existence of a predetermined excess pressure as between the interior and the exterior of the cylinder.

15. A baby's feeding apparatus substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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